



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

BULLETIN
OF THE
TORREY BOTANICAL CLUB.

Vol. 21.

Lancaster, Pa., May 25, 1894.

No. 5.

Contributions to American Bryology.—VII.

BY ELIZABETH G. BRITTON.

A REVISION OF THE GENUS *PHYSCOMITRIUM*, WITH
DESCRIPTIONS OF FIVE NEW SPECIES.

(PLATES 197–203.)

When Sullivant's Mosses of the United States was published in 1856 he recognized three species in this genus, two with European names, one of which has since been referred to *Pyramidula*; the third, *P. immersum*, having gone through the transitional stage of bearing a European name which did not belong to it, by being distributed as *P. sphaericum* in Sullivant's Musci Alleghanienses.

We think as much harm may be done, however, by referring well-known species to old disused names as by adopting European names without comparing specimens, and therefore it has been attempted in this contribution to see the originals in all cases.

The Manual of mosses of North America describes six species. The first, *P. immersum* Sull., is clearly defined and understood. The second, *P. pygmæum* James, has only been collected once, is poorly described, and the only fragments of it preserved in Sullivant's herbarium are a slide and a drawing. The third, *P. pyriforme* (L.) Brid., is a European species, the typical form of which does not occur in America. In a footnote several American varieties are briefly described. The fourth, *P. Hookeri* Hpe., is correctly understood, and the name has the right of priority, but the first synonym given belongs to the last species. The fifth, *P. acumin-*

atum (Schleich.) Br. & Sch., may be said also to be correctly understood, though from the localities cited it is probable that two species are included in the description. The sixth, *P. turbinatum* Müller, is a duplication of names not intended by Müller, and should replace *P. pyriforme* for the American forms of this variable species.

Since the publication of the Manual, three other species have been described from Macoun's collections by Kindberg, *P. megalocarpum*, *P. strangulatum*, and *P. platyphyllum*. The first will stand for the large Western forms of what we have been calling *P. pyriforme*, the second is a synonym of *P. turbinatum*, and the third is described from such very immature specimens that it will also probably not stand, though Prof. Macoun and Mr. Fletcher owe it to students to follow this species up, and collect, if possible, more and better specimens.

Five other well-defined species are described and figured in this contribution, and more specimens from the West and South are desired.

PHYSCOMITRIUM IMMERSUM Sull. in A. Gray, Man. Ed. 2, 651 (1856); Icones, 93, t. 56 (1864).

P. sphaericum var? Sull. Musci. Alleghen. No. 196. (1848).

This species is the only one of the genus which matures its capsules in the fall, and is liable to be mistaken for *Aphanorhegma serrata*, which it closely resembles. The Manual says it "differs merely in the inflorescence, the dehiscence of the lid, and the leaves more distinctly serrate by yellowish cells." The splitting of the capsule exactly in the middle and the thickening of the angles of its cells sufficiently distinguish *Aphanorhegma*, whereas the annulus and border of 2-3 rows of denser transversely elongated cells of the capsule in *P. immersum* shows its alliance with the genus to which it has been referred.

Type locality: "River banks, Southern Ohio, Lea." It has also been collected in Western Pennsylvania, by Lesquereux; on the banks of the Allegheny river, by D. A. Burnett; of the Susquehanna, by J. K. Small; along the Delaware at Camden and Philadelphia, by T. P. James and C. F. Austin; along tidal ditch banks at Wilmington, Delaware, by A. Commons; at Albany, New York, by C. H. Peck; on sandy clay bank of the Mississippi river, at Winona, Minn., by J. M. Holzinger; in a dry slough

in Saline county, Missouri, by C. H. Demetrio; Colorado, Wolf & Rothrock, 1873; South Carolina, Ravenel; on inundated alluvial soil (in small tufts) along the outlet of Leamy's Lake, near Hull, Quebec, October 4, 1889, Macoun.

EXSICCATAE: Sull. Musci. All., No. 196; S. & L., Musci Bor. Am. Ed. II., No. 233; Austin Musci App., No. 179.

PHYSCOMITRIUM PYGMÆUM James, Bot. King's Exp. 404 (1871).
L. & J. Manual, 197 (1884.)

(Plate 197, from original drawings by Sullivant.)

Plants small, 3–5 mm. high; stems leafy, simple or sparingly branched; leaves longest at apex, oblong acuminate, serrulate, vein ending in or below the apex; seta short, almost immersed, twisted to the left, as long as the oblong-pyriform capsule; annulus of two rows of narrow cells, persistent; mouth bordered by 5–7 rows of oblong cells; neck tapering with few stomata; lid large, conic apiculate; calyptra lobed and beaked, spores rough, .028–.031 mm., maturing?

Utah, Watson, 1869; not collected since. Only fragments are preserved in Sullivant's herbarium.

Type locality: "On the ground above Parley's Park, in the Wahsatch mountains, Utah, at 6,500 feet altitude, Watson; a few imperfect specimens."

The description given of this species in the Manual is misleading, as the plants are compared with both *P. immersum* and *P. Hookeri*, and it is not stated whether the capsules are immersed or exserted. The printer has also increased the confusion by transposing the phrase "marginal cells transversely oblong, in 5–7 rows," to apply to the leaves, whereas it refers to the mouth of the capsule.

The following description was sent to us by Dr. B. L. Robinson from Sullivant's herbarium, with the original drawing made by Sullivant, which we have been permitted to copy and reproduce:

"109. PHYSCOMITRIUM PYGMÆUM, Sp. Nov.

"Plantæ generis minima, a *Physcomitio pyriformi* distat exiquire foliis minus distincte serratis; capsula oblonga-pyriforme cellulis marginalibus transverse oblongis in seriebus 5–7 (nec 12–15) dispositis instructa basi paucius stomatifera; operculo longiore; pedicello toto sinistrorsam torto," etc.

"The shape of the capsule with its adherent annulus readily distinguishes this species from *Physcomitrium hians*, Lindb."

PHYSCOMITRIUM PYRIFORME (L.) Brid. Bryol. Univ. 2: 815 (1827).

Bryum pyriforme L. Sp. Pl. 1580 (1753).

Gymnostomum Physcomitrium pyriforme Brid. Bryol. Univ. 1: 98 (1826); also of all subsequent European authors, not American.

We have in the Jaeger and Torrey herbarium specimens of this species from all parts of Europe. The first and most striking difference observed between European and American specimens is the uniform length of the pedicels in the former and the regular, more pyriform capsules, which are larger than the American specimens and dry more uniformly in shape and color; the lid also is flat, the beak longer and more sharply apiculate when dry; the neck is shorter and less contracted below the spore-sac when dry, and the capsules are none of them as conspicuously constricted below the mouth as in our specimens. Even from macroscopic differences the species seem to be distinct, but when we examine the mouth of the capsules we find that the annulus is more highly differentiated in European specimens, being double, and falling in fragments with the lid, while in American specimens it is single and persistent, composed of a narrow row of orange-colored cells with the second row of hyaline vesicular cells bent in after the falling of the lid. The walls of the capsules, too, are different; in European specimens the cells are lax and indistinct, in American they are regular and very clearly outlined by their thick cell walls. Those around the mouth are seldom more than 12 rows, usually 8-12, whereas Limpricht says of the European, 8-16.

PHYSCOMITRIUM TURBINATUM (Michx.) Brid. Bryol. Univ. 2: 815 (1827).

Gymnostomum turbinatum Michx. Fl. Bor. Am. 2: 286 (1803).

Gymnostomum dilatatum Beauv. Prod. 59 (1805).

Gymnostomum splachnoideum Beauv. Prod. 59 (1805).

Gym. Physcomitrium tortipes Brid. Bryol. Univ. 1: 100 (1826).

Physcomitrium turbinatum Mueller; L. & J. Man., 198 (1884).

Physcomitrium pyriforme, not Brid. of American authors.

On consulting the original descriptions of the above references it will be seen that in all cases but the last they were based on American specimens by European authors and indicate a difference in comparison with the European *P. pyriforme*. They

also indicate the variability of the American species, though the variations are not constant enough to be specific, and hardly sufficient for varietal rank. For the sake of the argument the original descriptions are quoted:

Gymnostomum turbinatum Michx.

"G. brevicaule simplex: foliis lanceolatis, apiculatis, serrulatis sporangio oblongiuscule turbinato; operculo convexo, submamilato.

"Habitus et magnitudo *G. pyriformis*; pedunculo longiore; sporangio excusso operculo magis truncato minusque crasso.

"Hab. in Carolina inferiore."

"*Gym. dilatatum* Beauv. Caule simplici erecto foliis spathulatis apici serrulatis, pyxidibus pyriformis orificio magno, patulo."

"Amerique Septentrionale."

"J. 'ai rapporte cette espece des Etats-Unis d'Amerique (Caroline du Sud), elle est remarquable par l'orifice large et très-ouvert de l'urne; du reste elle a le porte du *Gym. pyriforme*. Elle croît dans les lieux inondés."

"*Gym. splachnoideum* Beauv. caule simplici erecto; foliis ovato lanceolatis, serrato-dentatis, acuminatis, costa integra notatis, pyxidibus oblongis." Amerique septentrionale.

"Je l'ai trouvée dans le nouveau Jersey: elle differe du *Gym. pyriforme* par la forme de l'urne, qui est comme étranglée au milieu."

"*Gymnostomum Physcomitrium tortipes* (Bernh. Brid.) caule erecto simplici, foliis ovato-lanceolatis concavis strictis subpatentibus, pedunculo gracili flexuosissimo, thecæ turbinatæ superne coarctatæ operculo umbonata."

In America septentrionali circa Philadelphiam habitat. Clar. Bernhardi communicavit.

"Specie, ut videtur, distinctum a *G. turbinato*, quod thecæ forma æmulatur, pedunculo nullatenus crasso stricto, sed valde flexuoso, præsertim in statu sicco ita ut theca nutet, unciale, longiore. A *splachnoideo* autem differt theca non in medio sed apice coarctata, ut et pedunculis duplo longioribus, gracilioribus, contortis; ab utroque tandem foliis strictis, aqua sese pulchre explicantibus. Rete vasculosum etiam diversum.

Through the kindness of M. Bescherelle and M. Franchet, I have been permitted to examine Michaux's types of *Gymnostomum turbinatum*. Three specimens were sent to me from Richard's herbarium in the Musée d' Histoire Naturelle at the Jardin des Plantes. They were collected by Michaux, and are undoubtedly

the specimens from which the description was drawn. They represent different specimens from different habitats, as they are not all in the same stage of development, but they show the same variations that other North American specimens do. Several of the plants are larger than the average, 15–25 mm. high, the stems short and simple or branching, several are 15 mm. high with more than one capsule on a plant. They are particularly noticeable for the different lengths of the pedicels, for the turbinate capsules, and the blunt lids, all of which points Richard recognized as different from the European species.

I have not seen the types of the two species described by Beauvois, but from the descriptions I do not think there is any doubt that they all refer to one very variable species.

Dr. Torrey corresponded with and sent specimens to Bridel, and I find in his herbarium four specimens numbered and named presumably by Bridel, as follows:

11. *Gymnostomum pyriforme*, without locality, presumably American.

29–30. *Gymnostomum turbinatum*, collected by Schweinitz.

31. *Gymnostomum splachnoides*, from Canada.

They are all referable to *P. turbinatum*. It will be remembered that as late as 1826 Bridel, in the *Bryologia Universalis*, maintained three American species as distinct from *P. pyriforme*.

Physcomitrium turbinatum Müller, ined. L. & J. Man. 198 (1884).

G. turbinatum Michx. is given as a synonym of *P. Hookeri* in the Manual, but this is evidently a mistake. Lower down on the same page *P. turbinatum* Müller, ined., is described as a species, thus duplicating a specific name in one genus, and confusing the synonymy. In order to settle the doubts raised by this mixture, I wrote to Paris, and M. Bescherelle sent me a portion of Boll's Texan specimens from the herbarium of C. Müller, these being the ones from which the description of *P. turbinatum* in the Manual was drawn. In his reply, dated May 1, 1893, Bescherelle says: "Quant au *Physc. turbinatum* du Texas (Boll legit) attribué par Lesquereux et James a C. Müller, je ferais remarque que Müller me l' a envoye sans nom d' auteur, dans la pensee que je n' ignorais pas que cette espece etait celle de Bridel, Michaux,

Richard, autrement il n'aurais négligé de mettre son nom a la suite du nom spécifique, comme il le fait toujours."

I had already suspected that this might be the case, and had written to Müller asking him whether he intended to make a new species or refer Boll's specimens to *G. turbinatum* Michx. He returned my letter annotated, and in reply to the above question says, "Ad hancce speciem" (to this very species). T. Boll's specimens collected in Dallas County, Texas, are represented in our herbarium by three packets, one received from M. E. Bescherele, ex herb. Müller, and two from the Jaeger herbarium. One of these is an autograph specimen from Müller labeled "*Physcomitrium pyriforme* var. *turbinatum*," and the other was found in a package of unnamed mosses collected by Boll, sent by Müller to Dr. Jaeger. The plants all agree, as the Manual says, in being "cæspitose" and "much divided," some of the stems are 25 mm. long, and branch three times. The leaves are distinctly acuminate, but the vein is not excurrent, and the margins are distinctly serrate above the middle, not "entire at apex." In my letter to C. Müller I asked about this point, and he says "apice grosse serrata." In the footnote in the Manual the leaves are said to be entire at the apex or nearly so, which seems a strange mistake to make, as they had authentic specimens; the capsule, too, is said to be without a "collum," but Müller says, "Non sed collum apophysatum adest." Our specimens show the neck wrinkled and contracted below the spore-sac when dry, and stomatose. The capsules are rather large, nearly 2 mm. long, lid flat and blunt, seta 10-15 mm. long, the mouth bordered by twelve rows of transversely elongated cells, and quite flaring when dry. The longest leaves are 4 mm. long, and the resemblance of the plants to the lax forms distributed by Sull. & Lesq. Musci Bor. Am. Ed. II. No. 234, as *P. pyriforme* is very close. They evidently grew in a damp muddy place. Similar specimens were collected by L. M. Underwood at Orange Bend, Fla., by Parker at Camden, N. J., and at Fort Edward, N. Y., by E. C. Howe. We have specimens from the vicinity of New York City, grown in wet places, which are much taller and more lax than the form from dry fields.

Kindberg has been struggling with the same difficulty in

studying Macoun's mosses, and has also succeeded in making another synonym, which is very suggestive of the most conspicuous characteristic of our North American species. In the *Ottawa Naturalist* (4: 62, 1889) he described *P. strangulatum* Kindb., which later, in Macoun's Catalogue (Part 6: 103, 1892) is referred to *P. turbinatum* C. M. (L. & J. Man. 198). The specimens from both localities cited in the catalogue have been sent to me by Prof. Macoun, mixed together in one packet, so that I cannot tell from which locality the large lax ones, which match Boll's Texan specimens, were collected, but they are correctly referred to "*P. turbinatum* Müller," probably by Müller himself, who has recently been verifying some of Kindberg's determinations.

P. platyphyllum Kindb. Macoun's Cat., Part 6, 269 (1892).

We have tried to get good specimens of this species, but neither Prof. Macoun nor Mr. Fletcher have any but immature specimens, and from the description it seems evident that the types also were "unripe." Prof. Macoun kindly sent us all he had, and we have compared them with all the immature specimens of *P. turbinatum* in our collection and have been forced to the conclusion that this must also rank among the synonyms of that species.

We have no desire to suppress or supplant any well-established new species, but cannot adopt a name, and refer other specimens to it, when it is impossible to say that we are sure we should recognize it again. These specimens of *P. platyphyllum* have no character. They are too young to show the mature shape of the capsule, or the lid, or the size of the spores, and deserve to be relegated to the limbo of uncertainty, but as so few specimens of *P. turbinatum* have been collected in Canada it may incite others to gather specimens whenever they see them, hence the following amended description is given:

Physcomitrium platyphyllum Kindb.; Macoun's Cat. Part 6, 269 (1892).

Plants gregarious, stems simple or branched at base; leaves sublingulate, 2-3 mm. long, serrate above the middle, upper very broad ovate-acuminate, indistinctly margined; vein percurrent or ending below the apex; cells wide subhexagonal, the basal subrectangular. Seta 5-10 mm. long, stout, pale yellow, bent; capsule too immature to see the ultimate shape; lid conic, blunt; cal-

yptra 7-8 lobed; mouth bordered by 8-10 rows of cells, annulus orange-colored, with a vesicular row bent inward; spores immature.

On earth in the streets of Ottawa, Ontario, Fletcher. Differs from *P. turbinatum* in the broader leaves? Macoun's number 597 Canadian mosses was distributed as *P. pyriforme*, from two localities, Windsor and Sandwich, Ontario, May 24, 1892. It contains two species, growing together, *P. turbinatum*, a small slender form, scarcely mature, and *P. Drummondii*, a few large, ripe capsules, with much thicker pedicels, and dark brown in color.

If we turn to Renauld and Cardot *Musci Americæ Septentrionalis*, p. 31, we shall find that we have another tangle of new names and old ones to deal with. Thanks to the generosity of M. Cardot, I have been favored with authentic specimens of all his types of this genus and have been able to make some very interesting comparisons and corrections. Their check-list enumerates *P. pyriforme*, Brid., as an American species, and after calling his attention to my views, M. Cardot still maintains that it is, and sends me a portion of his set, *S. & L. Musci bor. Am., Ed. II., No. 234*, as an example. I have compared his and ours with European specimens and am still forced to differ from him, for reasons already stated.

Three varieties are listed:

"Var. *tortipes* (Brid.) Sine loco." The specimens referred to in the Manual under this name are Drummond's No. 25 from Apalachicola, Fla., though this is probably not the form so named by Bridel, whose specimens came from Pennsylvania.

"Var. *floridanum*, R. & C. A forma typica foliis longioribus longius acuminatis, magis serratis capsulaque ore valde dilatato, vacua cupuliforma, diversa."

We presume he means by "forma typica" the European species. In a letter received October 18, 1893, he sends me this variety as equal to *P. turbinatum*, admitting my conclusion as far as these specimens are concerned and dropping this varietal name.

"Var. *Langloisii*, R. & C. Bot. Gaz. 94, 1889, N. J., La."

We have examined the specimens collected by Langlois and authenticated specimens from Cardot. They are unlike any Northern specimens in their long, slender pedicels, narrow, tur-

binate, almost campanulate capsules, and pale yellow color. We have it from several other Southern localities and collectors, and it maintains its individuality. We also have the specimens collected at Atco, New Jersey, by H. A. Green, which have also been referred by the authors to this variety, and some specimens collected in the vicinity of New York from wet localities, were so named by M. Cardot. We regret that he should not have maintained this varietal name for the lax, pale, slender, Southern form, from which it was originally named, and not extended it to include all our taller Northern ones, which are not at all constant, and are dependent on exposure, soil and moisture.

We are inclined to think that var. *Langloisii* is almost worthy of specific rank, and have figured it in order to call attention to it, and obtain more material.

P. Hookeri var. *serratum*, R. & C. "A forma typica foliis dimidio superiore grosse et obtuse serratis distincta."

We have received from both Cardot and Henderson duplicates of the specimens on which the above variety was based. We cannot find the well differentiated annulus so characteristic of *P. Hookeri*, and have since discovered that they are identical with the specimens we sent to M. Cardot under two manuscript names from two localities; the first collected by Langlois in Louisiana, was named for that state, and the second collected by Jermy in Texas was named for that state. Further comparison and study have convinced me that all three are identical with the specimens collected by Drummond near New Orleans and distributed in 1848 as *P. pyriforme*, var. 3, No 24, of his Southern mosses. We have named it *PHYSCOMITRIUM DRUMMONDII*, after the original collector, and rejected both our own manuscript names, as the species is found to have a much wider range than we at first supposed.

We wrote to M. Cardot, giving him our views on the differences between the European *P. pyriforme* and the American *P. turbinatum*, and at the same time calling his attention to the fact that his var. *serratum* could not be referred to *P. Hookeri*, on account of its simple annulus. He admitted the correction, and transferred it to the American species, as *P. turbinatum*, var. *crassipes*, m. s. This name has not been published, though we have given him abundant time to do so, as it is over six months since our

correspondence on this subject. We would have adopted his name, which is very appropriate, in reference to the thick pedicel, if M. Cardot had taken the trouble to compare all the specimens as I have done, and had then recognized its claim to specific rank, but we question his right to coin another varietal name for one already printed, even though the first name, *serratum*, was less suitable under the new species to which he referred it than under the old, and we also disagree with the second specific determination, as the capsules have only 5–7 rows of cells around the mouth; the lid is apiculate, and the spores are larger than in the species to which he has referred it. We cannot use his original name, *serratum*, for the name of the species, because it has already been used in the genus as one of the synonyms of *Aphanorhagma serrata* by C. Müller.

Both of our own manuscript names, which we have rejected, have priority over his varietal one, and he had authentic specimens of both from us at the time that he might have compared with his.

Physcomitrium turbinatum (Michx.) Brid.

Plate (198.)

The following description is drawn from American specimens only:

Plants light green, gregarious, 8–20 mm. high; autoicous-antheridia terminal on lateral or basal branches; stems short and simple or taller and branching, 3–10 mm. high; leaves 3–5 mm. long, oblanceolate or obovate from an oblong base, serrate above the middle; vein ending below the apex or occasionally excurrent into an acuminate apex; lower cells oblong, upper rhomboidal or hexagonal, the marginal longer and narrower, often yellow and inflated at their upper ends; seta 5–15 mm. long, erect or twisted and occasionally arcuate; capsule erect, 1–2 mm. long globose-pyriform when fresh, becoming turbinate, and contracted below the mouth and spore-sac when dry, dark brown and often urceolate when empty; lid convex or mamillate, occasionally apiculate when dry, blunt; mouth bordered by 8–12 rows of cells and a narrow row of orange-colored cells, with a hyaline vesicular annulus, which is persistent and incurved after the falling of the lid; calyptra cucullate, oblique and split unequally, 5–8 lobed and beaked; spores rough, .027–.035 mm., maturing in spring.

A common but variable species in old fields, grassy open places in gardens, etc., from Florida to Ontario, west to the Rocky

Mountains and California(?). Type locality in South Carolina. Founded on lax specimens.

Var. *LANGLOISII* (R. & C.) E. G. Britton.

(Plate 198.)

P. pyriforme var. *Langloisii* R. & C., Bot. Gaz. 14: 94 (1889).

Plants pale yellow; stems usually short and simple, slender; occasionally tall and branching to 2 cm.; leaves narrow, acuminate, often 5 mm. long; seta filiform, 10–20 mm. long; capsule small, 1 mm. long, almost campanulate, not contracted below the mouth when dry, neck tapering, often contracted below the spore-sac. Spores maturing in January and February, .027–.035, spinose.

In low swampy ground and in gardens, probably only in the Southern States. Type locality, in Louisiana, Langlois, also collected by Joor and Featherman; Texas, Hockey; Florida, Chapman and J. D. Smith.

PHYSCOMITRIUM MEGALOCARPUM, Kindb. Bull. Torr. Bot. Club, 16: 94 (1889).

Plants the largest of the genus often 3–4 cm. high, light yellow or brown when old; stems short, simple only 3–5 mm. high; leaves spreading flat and open when dry, not much twisted or shrivelled, 5–7 mm. long, 1.5–2 mm. broad, lanceolate from a lax oblong base; lower cells large, inflated at angles, marginal longer and narrower in two rows, yellow, entire or serrulate; vein ending in the acute or acuminate apex; vaginule 1–2 mm. long; seta 15–25 mm. long, erect or twisted and bent; capsule large, globose-pyriform, nearly as broad as long, 2–3 mm., usually urceolate when dry contracted at neck and below the mouth when dry; lid conic, bluntly apiculate, mouth small, not flaring, bordered by a narrow orange-colored annulus with a second hyaline row and 8–12 rows of denser, but slightly elongated cells; neck short, stomatose; spores rusty brown, spinose, .027–.035 mm., ripe from April to June.

Type locality Victoria, Vancouver Island, Macoun, Canadian Mosses No. 147, also collected by Bolander in California; Watson, Nevada; Henderson, Oregon and Piper in Washington.

Differs from *P. turbinatum* in its greater size, larger, more urceolate capsule, with a longer seta, and in the less inflated cells of

the margins of the leaves. The cells bordering the mouth are smaller, which gives it a more pyriform urceolate shape when dry.

PHYSCOMITRIUM AUSTRALE n. sp.

(Plate 199.)

Gymnostomum tortipes Hook.: in Drummonds' Southern Mosses No. 25 (1848), non Brid. Bryol. Univ. 1: 100 (1826).

Autoicous, the antheridia terminal and coterminous with the fruiting axis. Plants gregarious, tall slender, 3-4 cm. high; stems 25mm. tall, branching repeatedly and rooting at the joints; lower leaves short distant, with the vein ending below the apex, upper 3-4mm. long, 8-10 crowded around the base of the seta, all narrow oblong-lanceolate, serrate above the middle, marginal cells narrower and longer, teeth small appressed; vein ending below the acute apex; seta short, 5mm., pale, twisted and curved; capsules often cernuous, subglobose, becoming turbinate, and flaring at mouth when dry and empty, small, 1-1.5 mm. long, often broader than long, neck tapering, contracted stomatose; lid flat and apiculate when dry, conic when moist, bordered with brown; mouth bordered by 5-8 rows of large, clear cells and a darker annulus, with a second row of hyaline cells incurved and almost invisible, cells of the walls irregular with thick walls; spores rough, warty brown, .037-.043mm., maturing in spring.

Type locality Apalachicola, Florida, Drummond's No. 25, 1848. Not since collected, though specimens gathered by Dr. Garber in Southern Florida in 1878, and distributed as No. 268, resemble this species in the tall, leafy stems, but the pedicels are much longer, not curved, and the mouth is bordered by 8-12 rows of cells, and the spores are smaller. They are probably referable to *P. turbinatum* var. *Langloisii*, and show connecting characters.

The var. *Langloisii* seems to bear the same relation to *P. turbinatum* as var. *calvescens* does to *Funaria hygrometrica*, and *P. australis* corresponds to var. *patulum*. In both cases they are Southern in range, and are probably due to extreme heat and moisture in early spring. They both fruit earlier than the species at the North, and are taller, more slender and yellowish green.

PHYSCOMITRIUM HOOKERI Hampe, Icon. Musc. 3: t. 30 (1844).

Gymnostomum latifolium Hook. in Drummond's Musci Am. No. 16 (1828), non Brid.

Gymnostomum latifolium Schwaegr. Suppl. iv. t. 304 (1842).

Physcomitrium latifolium Lindb. Ofv. Akad. 21: 595 (1864).

Physcomitrium hians Lindb. Manip. Musc. 1: 51 (1870).

P. hians Sull. Icon. Musc. Suppl. 26, t. 16 (1874).

The first synonym given in L. & J. Manual has already been shown to belong to another species.

Drummond's No. 16 was issued in 1828 by Hooker and Wilson, with the following description :

"*Gymnostomum latifolium* n. sp. acaule, foliis paucis rotundatis acutis imbricatis reticulatis, seta breviuscula, capsula turbinata, operculo plano rostellato, calyptra mitriformi, quadrisixfida."

"Low points of the Saskatchewan, near Carleton House."

Sullivant followed Lindberg in calling it *P. hians*, and says in the Icones: "The reason for displacing this species to constitute of it a mere variety of Drummond's species is not evident. As has already been remarked by Wilson, in the London Journal of Botany (vol. 3, 433, 1841), it is very variable in size, some of the plants being as long as those of *P. pyriforme*, with which it is generally found mixed. Indeed, it apparently may be found passing into that species through intermediate forms."

In Sullivant's herbarium is preserved a portion of the type of *P. hians* Lindb., founded on part of Sullivant's specimens of No. 234, S. & L. Musci Bot. Am. Ed. II., and these were compared with Drummond's No. 16. They are all one species, so that we do not understand the meaning of the above remarks, especially as this species has the most highly developed annulus of the genus, and characteristic leaves. Unfortunately Hooker's very descriptive name, *latifolium*, was pre-occupied by Bridel for a Corsican species (Brid. Bryol. Univ. I. 760, 1826).

Hampe's name occurs incidentally under the description of *P. Thieleanum*, but he gives *G. latifolium* Hook. as a synonym, and cites Schwægr. Suppl. t. 304, so that this name, and not the one Sullivant figured it under in the Icones, will have to stand.

Type locality: "Low points of the Saskatchewan, near Carlton House, Drummond." It has also been collected in Manitoba and Ontario, by Macoun, Canadian mosses No. 146; Montana, R. S. Williams; South Dakota, T. A. Williams; Minnesota, Lapham and Holzinger; Kansas, W. A. Kellerman and Minnie Reed, and Ohio, Sullivant, by whom it was issued, mixed with No. 234, S. & L. Musci bor. Am. as *P. pyriforme*.

PHYSCOMITRIUM ACUMINATUM (Schleich.) Br. & Sch. Bryol. Eu. t. 300 (1841).

Gymnostomum acuminatum Schleich. Cat. Pl. Helv. 4: 40 (1821).

The description is drawn entirely from American specimens :

Autoicous, the antherida terminal on basal branches. Plants gregarious, pale green, slender, 10–15 mm. high; stems short, 2–3 mm., leaves almost radical, rosulate, 2–3 mm. long, oblong-lanceolate, acuminate, vein thick, ending below the apex or excurrent into a cuspidate point; marginal cells elongated in two rows, entire or subserrulate at apex, lower cells elongated, often brown at angles; seta pale, slender, twisted, 10–13 mm. long, often bent; capsules small, 1 mm. long, pyriform, becoming turbinate when dry, with a broad flaring mouth, not contracted below it; neck tapering, often abruptly contracted when dry; mouth bordered by 4–7 rows of narrow cells, but slightly elongated or thickened, those of the walls smaller than in *P. turbinatum* and rounded; annulus double, outer row orange colored, inner hyaline, vesicular, falling in fragments with the lid or persistent; lid blunt, conic or apiculate, bordered with orange; calyptra small 2 mm. long, lobed; spores small, .014–.021 mm., spinose, yellow, ripe in May and June.

Type locality in Switzerland. An uncommon species not yet reported east of the Alleghanies, ranging through the Central States both east and west of the Mississippi. Collected by H. J. Webber at Nebraska City, Nebraska, June 1, 1889; Argentine, Miss Reed, April and May, 1891; Cloud Co., W. A. Carlton; also Phillips Co., Kansas, Hatcher and Farm Ridge, La Salle Co., Illinois, J. W. Huett. Also by E. Hall in Illinois, according to the Manual.

Through the kindness of M. H. Philibert we have received a specimen supposed to be this species, collected by Gander near Lienz, in the Tyrol, in July, 1878. This is one of the specimens cited by Limpricht in his Laubmoose, but does not agree exactly with the description given by him, as the cells around the mouth, instead of being in 11–15 rows, seem to be only six. We have also recently received from Dr. H. Solereder a duplicate specimen from the herbarium of the University at Munich, collected by Wienkamp near Wasam, in May, 1865. They also have only 7–8 rows of cells around the mouth, and a narrow yellow annulus; the lid is short and blunt or truncate. The spores measure .024–.027mm., and are rough but not spinose.

This rare species has only been distributed once in European exsiccatae and never in American ones, so that we have not much material to guide us. Neither have we been able to see the speci-

mens cited in Lesquereux and James' Manual for this species, for they cannot be found in either Sullivant's or James' herbarium.

The description in the Manual does not fit the American specimens altogether, and we suspect from the localities that they may have confused our *P. Drummondii* with this species. The spores are described as "large." Limpricht cites them as .026-.032 mm., or a little smaller than in *P. pyriforme* and *P. turbinatum*. It will be seen that the spores in our specimens are much smaller.

The following remarks are copied from the Bryologia Europæa, and refer to *P. acuminatum* (t. 300):

"Cette espèce que nous avons reçue de Schleicher, se distingue du *P. pyriforme* par sa grandeur moindre, par ses feuilles plus longuement acuminées ordinairement à bords entiers ou à peine denticulés, par la nervure médiane de la feuille qui est excurrente ou qui ne cesse qu'avec le sommet du limbe foliaire, par l'embouchure plus large de la capsule sèche et enfin par les sporules presque de moitié plus grandes."

PHYSCOMITRIUM KELLERMANI n. sp.

(Plate 200.)

Autoicous, the antheridia terminal in basal buds. Plants scattered or gregarious, dark brown when mature, small, seldom more than 3-5 mm. high; stems simple, with basal innovations; leaves few, rosulate, 1-3 mm. long, ovate acuminate; vein excurrent into the subulate apex or ending below it; margins coarsely serrate; cells inflated, basal cells lax, scarcely elongated; seta short, 1-2 mm. long, scarcely exceeding the perichætal leaves, occasionally 3 mm. long and exserted; capsule short pyriform or globose when empty, contracted below the mouth or broadly flaring, bright brown when old, 1-1.5 mm. long, neck short, tapering or swollen into an hypophysis, stomatose, rugose; mouth bordered by 4-7 rows of cells, and a narrow persistent annulus of darker cells with a hyaline incurved row almost invisible; lid small, conic-rostrate; calyptra large, 2-2.5 mm. long, 3-lobed; spores large, .045-.048 mm., rough, warty, but not spinose, maturing in March and April.

Type locality, Manhattan, Kansas, Kellerman (1889); also collected by J. B. Hatcher at Long Island, Phillips Co., Kansas (1885) (ex herb. E. A. Rau), by Miss Reed at Argentine, Kansas; and by H. J. Webber at Nebraska City, Nebraska (1889).

Differs from *P. Hookeri*, for which it is liable to be mistaken, by its smaller size, flaring mouth and single annulus; from *P. turbinatum* also in the smaller size and narrow-bordered mouth; from both in its larger spores.

PHYSCOMITRIUM DRUMMONDII, n. sp.

(Plate 201.)

Physcomitrium acuminatum L. and J. Man. 198 (1884) in part?

P. Hookeri var. *serratum* Ren. & Cardot, Rev. Bryol. 19: 93 (1892).

Plants gregarious or scattered, 3–10 mm. high; stems with short basal branches; leaves narrow, strictly erect, lanceolate-acuminate, 2–3 mm. long, serrate above the middle, marginal cells longer and broader, inflated or yellow, basal cells lax; vein thick, ending below the apex or excurrent into a cuspidate point; seta stout, straw-colored or brown when old, short, only 3–5 mm. long, erect slightly twisted; capsules 1 mm. long, pyriform turbinate, not contracted below the flaring mouth when dry, bordered by 6–8 rows of narrow elongated, thick brown cells, very distinct from the cells, with sinuous walls of the rest of the capsule; annulus narrow, orange-colored, persistent, with a second incurved hyaline row; lid conic-rostrate, bordered by orange, beak as long as the spore-sac, which is shallow and broad; neck contracted below the spore-sac, stomatose; calyptra large, 2–3 mm. long; spores large, .040–.045 mm., warty, maturing April.

Type specimens collected by Drummond near New Orleans, and distributed as No. 24 of his Southern mosses in 1848 as *P. pyriforme*, var. 3. Also collected by A. B. Langlois, at Pointe à la Hache "on ground along roadsides 1886," and distributed as No. 44 of Ren & Cardot's, Musci Am. Sept. Exsic. Recently collected by B. F. Bush, at Campbell, Missouri, and ranging northward into Canada, Belleville, Macoun, west to Oregon, Henderson. The specimens sent to me from the Department of Agriculture, collected by Jermy in Texas, and referred to *P. acuminatum*, with some doubt, are also this species, differing from *P. acuminatum* in its smaller size, strict, erect habit, stout seta, narrow bordered mouth, rostrate lid and larger spores, which are warty not spinose, and double the size of any American specimens of *P. acuminatum*, which I have seen. We suspect Wright's Texan specimens cited in the Manual also belong here, though we have not seen them, but the spores are described as "large." Hall's Illinois specimens are probably *P. acuminatum*.

PHYSCOMITRIUM COLORADENSE n. sp.

(Plate 202.)

Autoicous, the antheridia in basal buds, few, large, without paraphyses. Plants small, 3–4 mm. high, scattered or gregarious; stems short, simple or with basal buds; leaves few, radical, erect, concave, 1.5–2 mm. long, base short, auriculate, cells lax, upper cells shorter, marginal serrate or inflated above the middle, with large irregular teeth, occasionally entire or serrulate only at apex; vein narrow, percurrent into a cuspidate apex, or ending below it in the lower leaves. Seta short, immersed, or partly exserted, 1–2.5 mm. long; capsule exserted, large for the size of the plants, nearly 2 mm. long, pyriform when fresh, becoming turbinate and contracted below the mouth and spore-sac when dry, bright orange or brown when mature; mouth bordered by 4–5 rows of narrow elongated cells, and a double annulus, the outer orange-colored, the inner vesicular, hyaline; lid large conic, rostrate when dry, also bordered with orange cells; spores warty, not spinose, .027–.037 mm., maturing in April and May.

Type locality, Colorado, T. S. Brandege, April 13, 1877, Eu. herb, E. A. Rau; also collected at Great Falls, Montana, on muddy banks of the Missouri River, by R. S. Williams, May 11, 1887, ex. herb. D. C. Eaton.

Resembling *Pyramidula tetragona* in the large size of the capsule as compared with the small size of the plants, but distinguished by the lobate calyptra and double annulus.

PHYSCOMITRIUM CALIFORNICUM n. sp

(Plate 203.)

Autoicous, the antheridial terminal, becoming lateral by innovations. Plants gregarious, 10–15 mm. high; stems simple, erect, short, 3 mm. high; leaves few, basal, oblong-lanceolate, 3 mm. long, bordered by a double row of elongated cells, entire or occasionally serrulate above the middle; vein thick, ending below the acute apex; cells lax, oblong, marginal obliquely septate. Seta 1–2 cm. long, slender, twisted, often brown; capsules small, 1–1.5 mm., globose when mature and empty, more or less cylindric when young; lid conic, short blunt; neck short, wrinkled and contracted below the spore-sac when dry, stomatose; mouth bordered by a narrow orange-colored annulus, and 5–11 rows of slightly denser, scarcely differentiated cells; calyptra cucullate, lobed and long beaked; spores brown, .027–.035 mm. warty, not spinose, maturing in Spring.

On the ground in California (Bolander), without date or locality. Specimens received from the Department of Agriculture in 1889, in a set of Bolander's duplicates, and also to be found in the Lesquerieux herbarium, as we learn from M. Cardot.

Differing from *P. acuminatum* in the shape of the capsule and length of the seta, having the slender aspect of *Entosthodon ericetorum*, but with a lobed calyptra, entire leaves, and no trace of a peristome. We have thought it best not to use the original manuscript name which I gave it (*sphærothecum*), as there is a European species *P. sphaericum*, which is named in reference to the globose capsules and a Mexican species, *P. subsphaericum*, Sch.

The following key is given to facilitate the determination of the species of this genus. Only six, of the eleven here enumerated, are known to occur within our limits, *P. turbinatum*, *P. acuminatum*, *P. Drummondii*, *P. immersum*, *P. Kellermani* and *P. Hookeri*. Two are Rocky Mountain species, *P. pygmæum* and *P. Coloradense*; two are Pacific Coast species, *P. megalocarpum* and *P. Californicum*; and *P. australe*, although here maintained as a species, more specimens may perhaps show that it is only an extreme form of *P. turbinatum*, into which it grades through the variety *Langloisii*. Collectors in our Southern States will do well to observe this species carefully and try to get its extreme forms. *P. Drummondii* may be said to be intermediate between *P. turbinatum* and *P. lanceolatum*, and probably ranges northward through the Mississippi Valley. Spore characters have never been carefully recorded heretofore, and these seem to furnish valuable assistance in determining the species which resemble each other.

KEY TO THE NORTH AMERICAN SPECIES.

Plants 5–10 mm. high, capsules immersed, bordered by two rows of cells.

1. *immersum*.

Plants 3–5 mm. high, capsules exserted, bordered by 4–7 rows of cells.

Annulus narrow, persistent, leaves serrate,

Plants 2–3 mm. high, seta short, almost immersed, stems leafy.

2. *pygmæum*.

Plants 3–5 mm. high, acaulescent, seta exserted, 1–3 mm. long.

3. *Kellermani*.

Annulus double, persistent or falling, leaves entire,

Plants 3–4 mm. high, seta short, immersed, capsule pyriform.

4. *Coloradense*.

- Plants 5–10 mm. high, seta 2–3 mm., exserted, capsule turbinate.
 5. *Hookeri*.
- Plants 5–13 mm. high, seta 5–13 mm., mouth bordered by 6–8 rows.
 Leaves acuminate, entire, lid blunt, spores .014–.021 mm., spinose.
 6. *acuminatum*.
- Leaves acute, serrate, lid rostrate, spores .040–.045 mm., warty.
 7. *Drummondii*.
- Plants 20–30 mm. high, mouth bordered by 4–8 rows of cells,
 Stems tall, leafy, branching, seta curved, spores .037–.042 mm., warty.
 8. *australe*.
- Plants 5–25 mm. high, mouth bordered by 8–12 rows of cells, spores .027–.035 mm.
 Margins serrate, cells inflated, spores spinose, annulus of two rows of cells.
 Capsules turbinate, 1–2 mm., mouth flaring, 9. *turbinatum*.
 Capsules pyriform, 2–3 mm., urceolate, mouth not flaring,
 10. *megalocarpum*.
 Margins entire, cells elongated, spores warty, capsules globose.
 11. *Californicum*.

The Genus *Cassia* in North America.*

BY CHARLES LOUIS POLLARD.

Since the publication of Bentham's monograph in 1871†, the genus *Cassia* has received no detailed treatment. The discovery of new material in the South and Southwest during recent years renders a revision of the North American species desirable. The present paper enumerates only those forms which are known to occur north of the Mexican boundary, the numerous tropical species being reserved for later consideration. The classification into subgenera, sections and series is that of Bentham, with such modifications as seemed necessary to adapt it to North American forms exclusively.

Analytical Key to the North American Species.

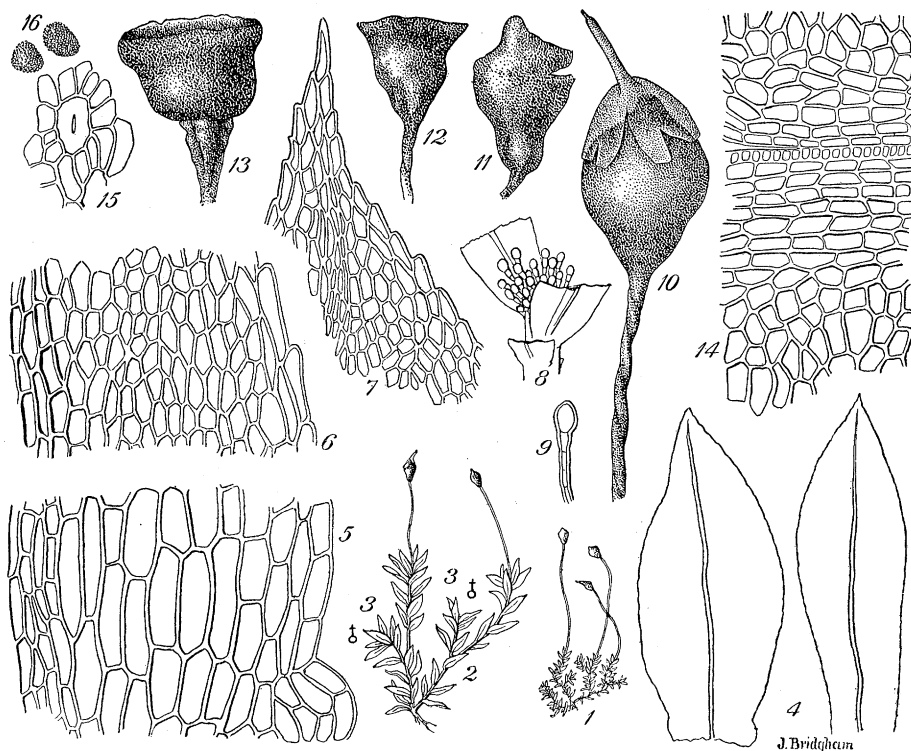
- | | |
|------------------------------------|------------------------|
| Leaves with a spinulose rhachis, | 27. <i>C. armata</i> . |
| Leaves with rhachis not spinulose. | |
| Leaves 2–9-foliolate. | |
| Peduncles 1-flowered. | |
| Leaves 2-foliolate, | 2. <i>C. pumilio</i> . |

* Submitted to the University Faculty of Pure Science of Columbia College as partial requirement for the degree of Master of Arts.

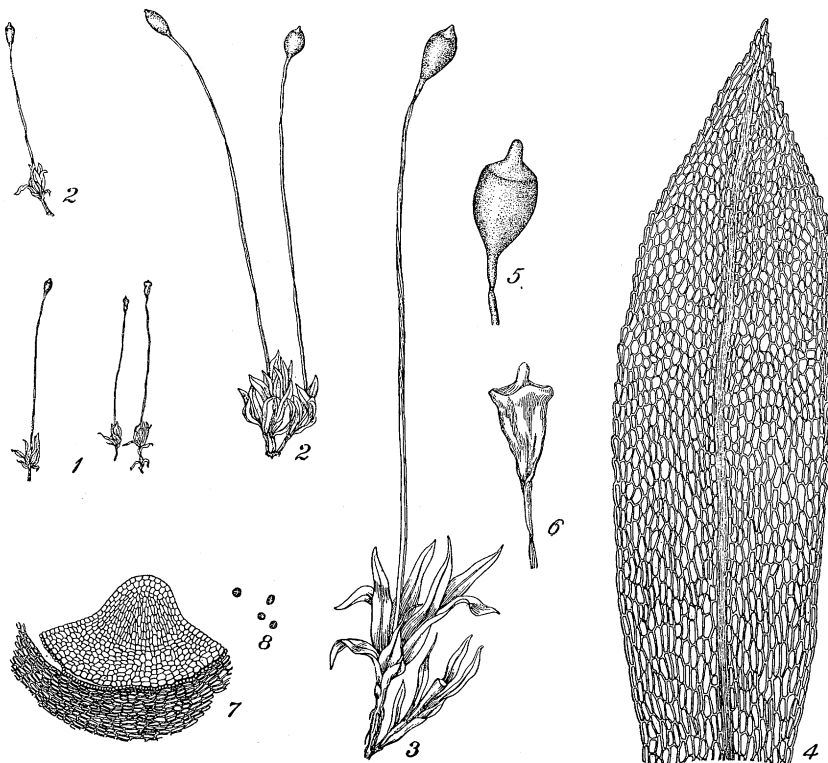
† Trans. Linn. Soc. London, 27 : 503–591.



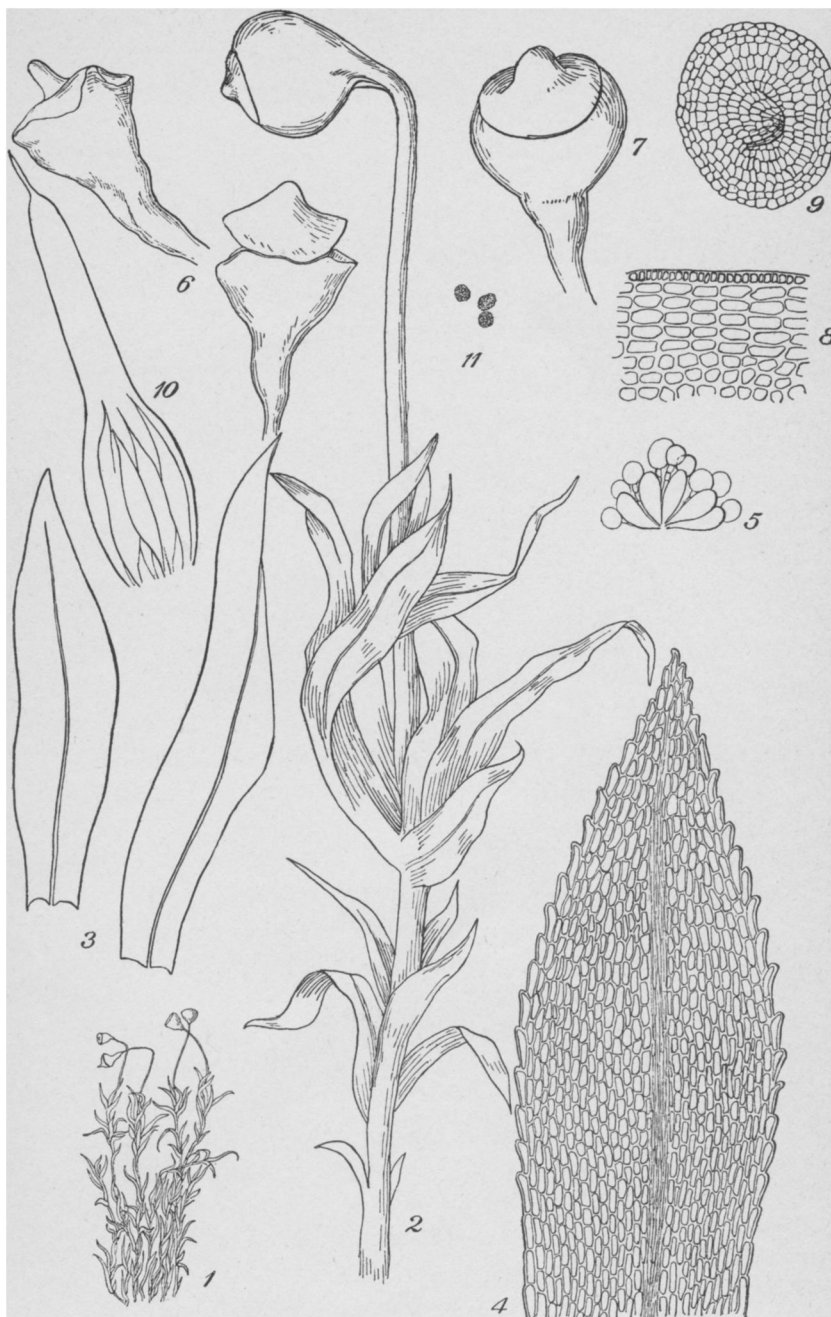
PHYSCOMITRIUM PYGMÆUM JAMES.



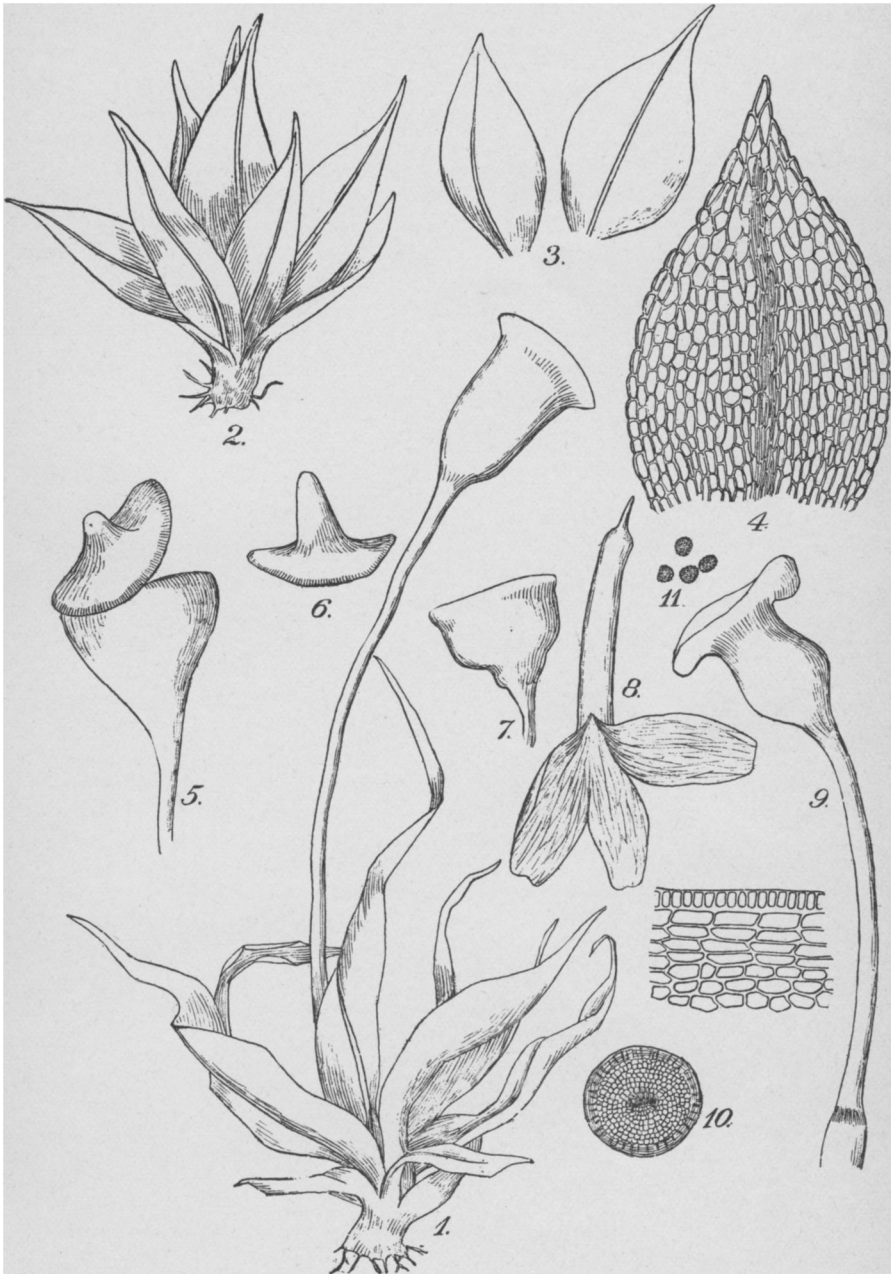
PHYSCOMITRIUM TURBINATUM MICHX.



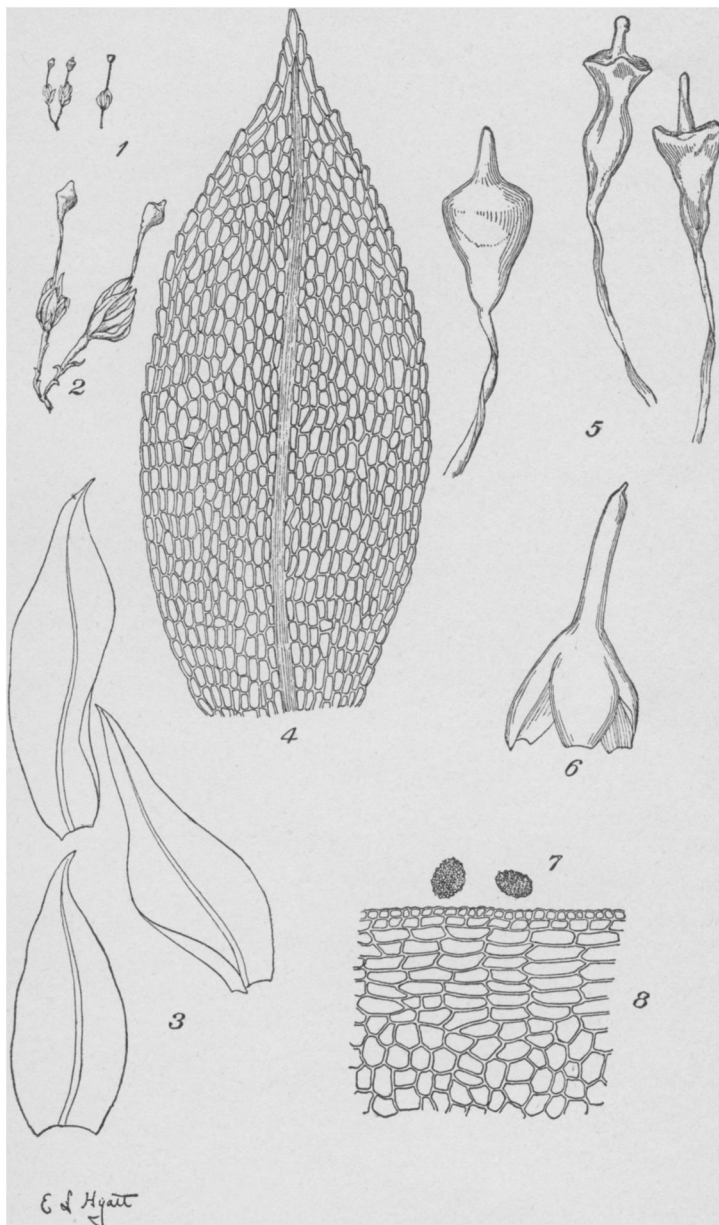
PHYSCOMITRIUM TURBINATUM LANGLOISII (REN. & CARD.) E. G. BRITTON.



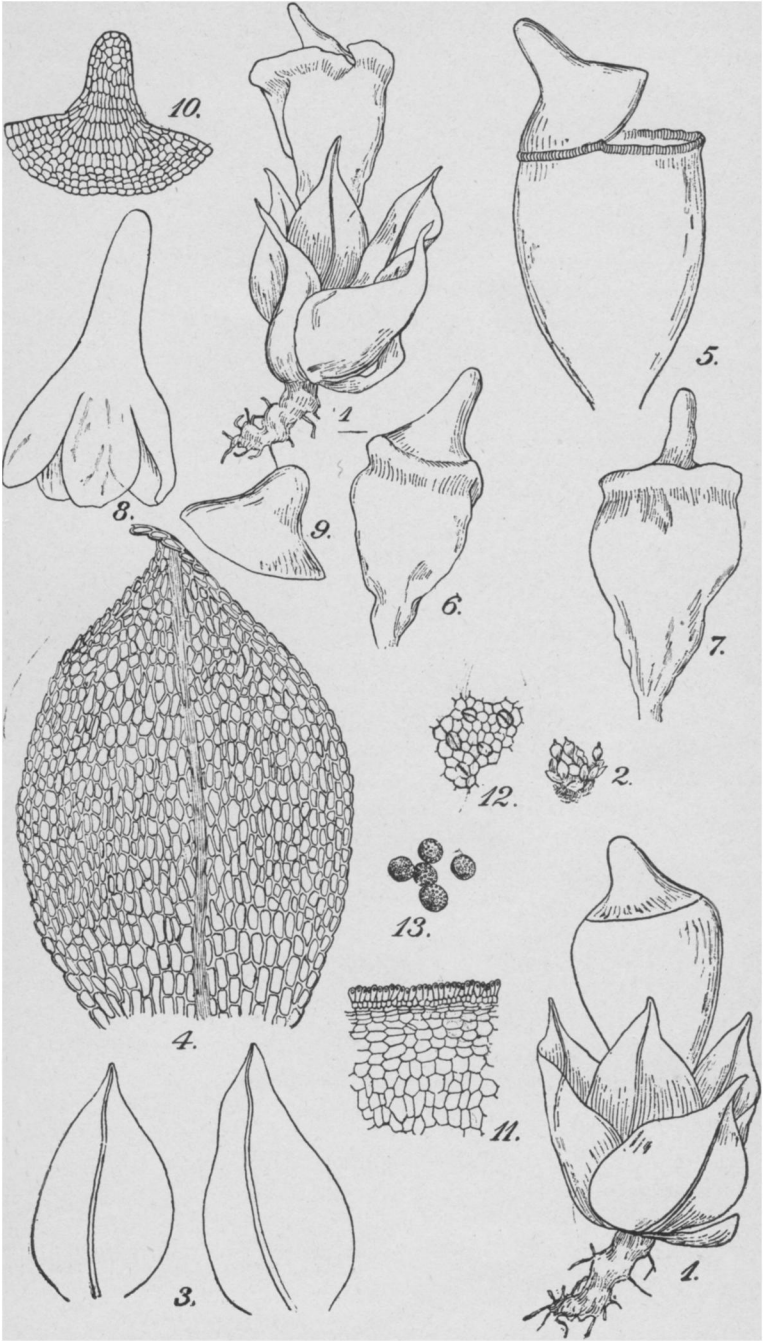
PHYSCOMITRIUM AUSTRALE E. G. BRITTON.



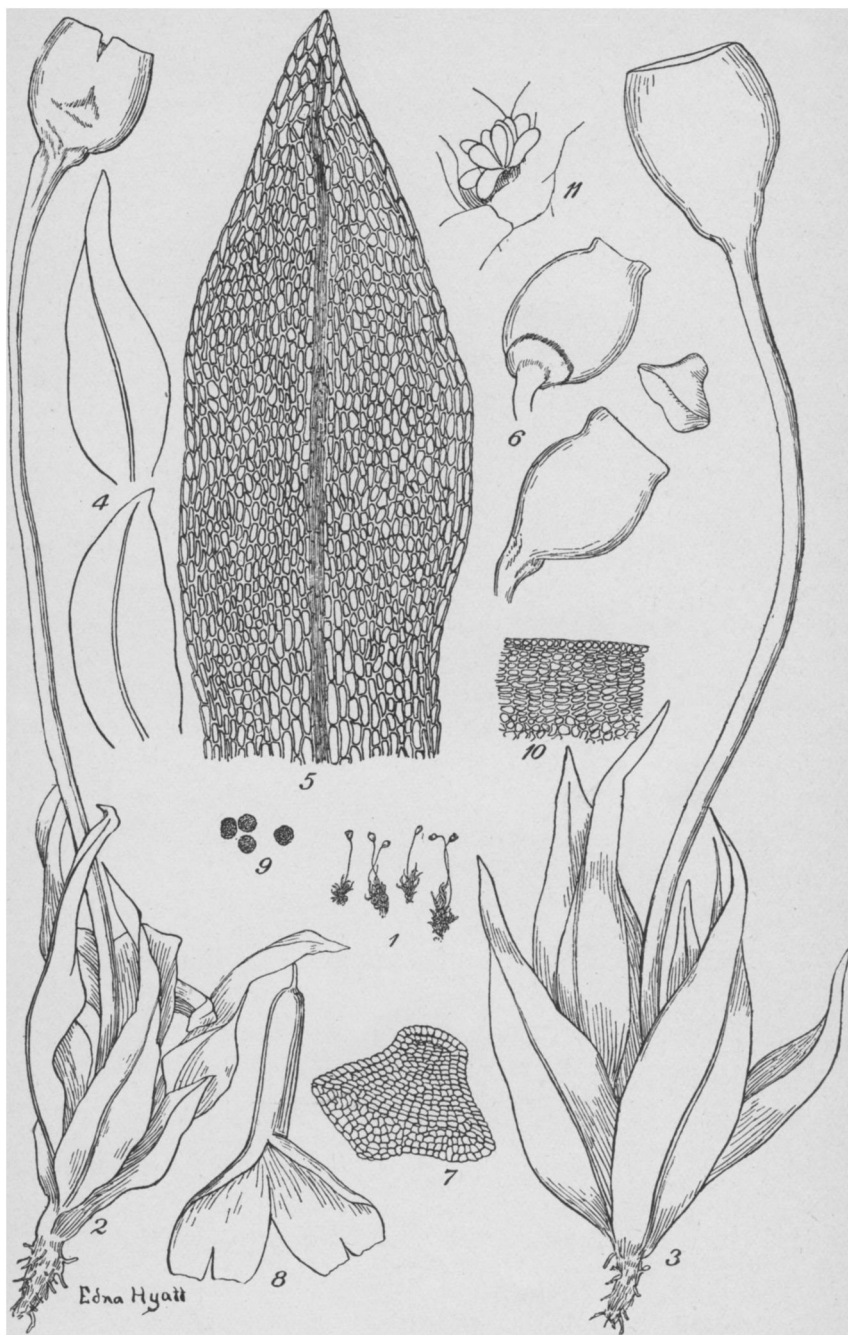
PHYSCOMITRIUM KELLERMANI E. G. BRITTON.



PHYSCOMITRIUM DRUMMONDII E. G. BRITTON.



PHYSCOMITRIUM COLORADENSE E. G. BRITTON.



PHYSCOMITRIUM CALIFORNICUM E. G. BRITTON.